- Please keep these instructions and review before using this controller.
- This instruction manual uses WARNING and CAUTION as signal words for safety.

WARNING WARNING indicates a potentially hazardous situation which, if not avoided, will result in death or serious injury.

1. In case of using this unit with machineries (warehouse, medical equipments, vehicle, train, airplane, nuclear power or safety devices etc.), it requires installing fail-safe device.
   ▶ **It may result in serious damage, fire or human injury.**
2. Use a rated voltage to prevent damage or trouble.
   ▶ **It may result in fire.**
3. Check the number of terminal when connect each line and signal input.
   ▶ **It may cause fire or trouble.**
4. Do not turn on the power until the wiring completed.
   ▶ **It may cause electric shock.**
5. Do not repair, wiring or checkup when electric power on.
   ▶ **It may cause electric shock.**
6. Installation the controller where there is no dust, corrosive or explosive gas, direct ray of the sun, mechanical vibration or shock present.
   ▶ **It may cause fire or explosive.**
7. This controller must be mounted pannel.
   ▶ **It may cause electric shock.**
8. Do not repair beyond of authorized technician.
   ▶ **It may cause trouble.**

CAUTION CAUTION indicates a potentially hazardous situation which, if not avoided, will result in minor or moderate injury and at other times or serious injury. It may also be used to alert against unsafe practice.

1. Ensure the surrounding ambient operating temperature is 0~50℃.
   ▶ **It may cause fire or wrong operation.**
2. Ensure the power supply for the controller does not fluctuate. Main supply voltage fluctuation not exceed ±10% of the normal voltage.
   ▶ **It may cause fire.**
3. This controller shall not be used outdoors.
   ▶ **It might shorten the life cycle or given an electric shock.**
4. When wiring connection, #20AWG (0.5mm2) should be used and screw bolt on terminal block with 0.74N.m strength.
   ▶ **It may result in malfunction or error.**
5. Keep the controller away from high current and voltage circuits. The controller and connection wires (esp. compensation conductors and RTD lead wires) should be kept approximately 30cm away from high electric circuit to limit the possible affect of noise.
   ▶ **It may cause display fluctuation or error.**
6. Do not use a place where temperature fluctuate or icing occurs.
   ▶ It may cause fire, explosive or error.
7. In dissing the controller, do not use water or an oil-based detergent.
   ▶ **It might cause an electric shock or fire that will result in damage to the product.**
8. Do not inflow dust or dregs into inside of this controller.
   ▶ **It may cause fire or trouble.**
9. Installation Category II, Pollution Degree 2, Altitude over 0~2000m use.

High Performance PID Controller

SDU Series

CE EN

Thank you very much for selecting Sanup temperature controller. For your safety, please read the following before using.

SANUP ELECTRIC
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1 Features

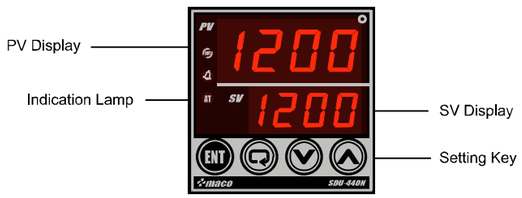
SDU is high performance general purpose PID controller. It is best controller for temperature, humidity and pressure etc.

Universal Input	K.J.E.T.C.B.R.S.Pt100Ω.V/mA dc
Universal Output	Relay, SSR, 4-20mAdc
Control Stop Timer	99h 59m max
Delay Output	Heater Protection
DC Power Supply	17V 30mAdc max.
Alarm	2 Point
Heat. Cooling Control	User Selectable
Retransmission Output	PV Out (Optional)
RS 485 MODBUS PC Interface	2 Wire Type (Optional)

2 Ordering Codes

MODEL	SIZE	-	CODE					SPECIFICATION
SDU	□	-	□	□	□	□	□	Digital PID Controller
	440							48(W)X48(H)X90(D) (mm)
	490							48(W)X96(H)X100(D) (mm)
	940							96(W)X48(H)X100(D) (mm)
	770							72(W)X72(H)X100(D) (mm)
	880							85(W)X100(H) (mm)-main board
	990							96(W)X96(H)X100(D) (mm)
Input			U					Universal Input
Range				0U				Full Range. See Input Table.
Control Output					U			Relay.SSR.4~20mA.0~10V
Power						F		100~240V ac. 50-60Hz
Optional							N	None
							2	4~20mA Ret. Output
							3	MODBUS RS 485 Interface
							6	RET. + RS 485 Interface

3 Functional Description

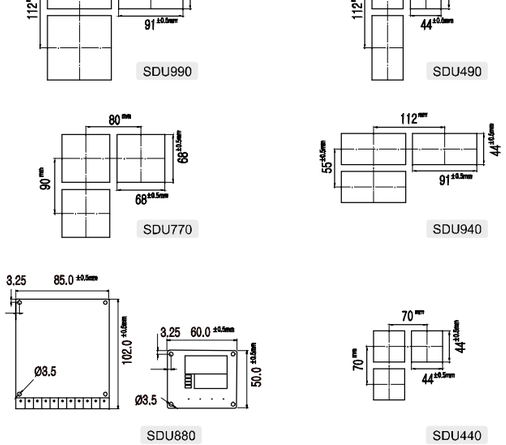


	KEY	FUNCTION
①	ENT	1. Enter set value 2. Timer ON/OFF
②		Call Parameters
③		1. Dec. or Increment of Set Value 2. Keep push 2 sec. more, will be fast dec. or inc. 3. Select Data

4 Specification

Items		Specifications
Power	Power	100~240Vac (90~264Vac)
	Frequency	50/60Hz
	Power Consumption	5VA less
	Insulation	between primary & secondary terminal: 500Vdc 20MΩ over
		between primary & ground terminal: 500Vdc 20MΩ over
		between secondary & ground terminal: 500Vdc 20MΩ over
	Dielectric Strength	between primary & secondary terminal: 2300Vdc 50/60Hz 1min.
		between primary & ground terminal: 2300Vdc 50/60Hz 1min.
		between secondary & ground terminal: 1500Vdc 50/60Hz 1min.
Input	Input	T.C: K.J.E.N.C.T.R.S.B RTD:Din Pt100/Pt100Ω Vdc: 1-5V.0-5Vdc 4-20mA(use Res.)
	Scan Time	130ms
	Impedance	T.C: 1MΩ
	Accuracy	T.C: ±0.3%+1digit or 3℃
		RTD/V. mAdc: ±0.2%+1digit
Output	Control	Relay Contact 250V 2A, R Load 4~20mAdc max. 600Ω SSR 20V 21mAdc
	Alarm	250Vac. 1A(R load)
	Retransmission	600Ω max. Programmable scale.
	TX Power	17V 30mAdc max.
	Interface	RS 485 MODBUS ASCII (optional)
Control	Control Mode	PID with Auto-Tuning. PI. ON-OFF
	Control Period	1~60sec.
Installation Condition	Continuous Vibration	5-14Hz: forward width 1.2m max. 4-150Hz: 4.9m/cm2
	Vibration	14.7m/cm2 15sec. max. each 3 direction
	Shock	147m/cm2 11msec. max. 6 direction 3 times
Operating Condition	Temperature	0~50℃
	Humidity	35~85%RH. No condensation
	Influence of Magnetic	400AT/m max.
	Warm-up Time	30min.
Operating Environment	Thermocouples	±1μV/℃ or ±0.01%/℃ of F.S
	RTD	±0.05Ω/℃
	Analog Output	±0.05%/℃ of F.S
Storage	Temperature	-25~70℃
	Humidity	5~95%RH. No condensation

5 Panel Cut



Installation Consideration

Keep installation below condition.
1. Keep operating temperature 0~50℃ **It may cause fire or wrong operation.**
2. Keep ac power is not fluctation **It may cause fire or wrong operation.**
3. Keep no corrosive or explosive gas present **It may cause fire.**
4. Keep no dust **It may cause fire or wrong operation.**
5. Keep no mechanical vibration or shock **It may cause wrong operation.**
6. Keep the controller away from high current and voltage circuit. The controller and connection wires (esp. compensation and RTD lead wire) should be about 30cm away from high power circuit. **It may cause wrong operation and display.**

Installation Procedure

1. Make a rectangular hole panel cutout. When installaing more then two controllers parallel to each other, keep distance between the panel cutout to above diagram.
2. Insert the controller into the panel cutout.
3. Insert a mounting clip into controller both sides and tighten the screws. Torque is about 14.7N.m

6 Set Parameters

Tuning Parameter Group

SIGN	PARAMETER	OPERATION
----	Processing Value	Display processing and set value
P	Proportional Band (0.1~999.8%)	If set to 0, control mode will be change to ON-OFF control mode with **ONOF** display.
I	Integral Time	5~9998 sec.
d	Derivative Time	0~2500 sec.
HYS	ON/OFF Hysteresis	Only use ON-OFF control mode. 1~200
AL-1	Alarm 1 Value	Set alarm 1 value.
AL-2	Alarm 2 Value	Set alarm 2 value.
CP	Control Period	1~60 sec.
t in	Control End Time	If set to 0, disable timer function.
At	Auto-Tuning	**ON**: Start Auto Tuning **OFF**: Stop Auto Tuning **tIng**: Processing with timer **tEnd**: End of timer
PASS	Password	Set pass no. for entering ex. parameters. Extension Group: PASS=**5** Optional Parameter Group: PASS=**15**

Note
1. Target value and alarm set value are limited by input sensor or display high/low scale.
2. Pass nos. are fixed factory.

Extension Parameter Group

SIGN	PARAMETER	OPERATION
InPt	Input Type	See 1. Input table
Un It	Unit	℃ or ℉.
dP	Decimal Point	Only V/mA input 0 / 0.0 / 0.00 / 0.000
SC-H	Scale High	Set high limit. Only V/mA input.
SC-L	Scale Low	Set low limit. Only V/mA input.
AL5.1	Alarm 1 set value	See 2. Alarm Table.
HYS.1	Alarm 1 Hysteresis	Set alarm 1 ON-OFF band (1~100)
AL5.2	Alarm 2 set value	See 2. Alarm Table.
HYS.2	Alarm 2 Hysteresis	Set alarm 2 ON-OFF band (1~100)
CACt	Control Mode	Heat for set **rEv**. Cool for set **dIr**.
oH-H	Output High Limit	50.0~105.0%
oH-L	Output Low Limit	-5.0~30.0%
d-to	Output Delay Time	0~30min. If set to 0, disable.
bOUt	Burnout	Set output % when sensor brake.
FILt	Filtering Time	0~60 sec.
InS	Compensation	Set display compensation (-100.0~100.0)

[1. Input Table]

SIGN	INPUT	RANGE ℃	RANGE ℉
K-tc	K-Type TC	-100~1370℃	-148~2498°F
J-tc	J-Type TC	-100~950℃	-148~1742°F
E-tc	E-Type TC	-100~750℃	-148~1382°F
n-tc	N-Type TC	-100~1300℃	-148~2372°F
C-tc	C-Type TC	0~2300℃	32~4172°F
t-tc	T-Type TC	-200~400℃	-328~752°F
K.1tc	K1-Type TC	-100.0~400.0℃	-148~752°F
r-tc	R-Type TC	-0~1760℃	32~3200°F
S-tc	S-Type TC	-0~1760℃	32~3200°F
b-tc	B-Type TC	-0~1800℃	32~3272°F
JPt	JIS Pt100Ω	-200~600℃	-328~1112°F
dPt	DIN Pt100Ω	-200~600℃	-328~1112°F
JPt.1	JIS Pt100Ω	-200.0~600.0℃	-328~1112°F
dPt.1	DIN Pt100Ω	-200.0~600.0℃	-328~1112°F
1-5	1~5Vdc		
0-5	0~5Vdc		

Optional Parameter Group

SIGN	PARAMETER	OPERATION
SP-2	2'nd Set Value	Set 2'nd set value
t-H	Retransmission High	Set Ret. high limit.
t-L	Retransmission Low	Set Ret. low limit
dnOd	Display Mode When Use Timer Function	SP Set value display rt in Remaining time display rOt Each display by turns
Add5	Address	Set address for RS485 interface. (1~31)
SPEd	Speed	Set interface speed 2400/4800/9600bps
PAr Y	Parity Check	none / odd / even
CdLY	Response Delay Time	1: 4~54sec 2: 54~104msec 3: 104~154msec
LddF	Parameter Initializing	If set to 123, all parameters will be Init.
OUPt	Set Control Output	Relay, SSR, 4~20mA

[2. Alarm Type]

ALARM	ALARM 1	ALARM 2
Alarm OFF	----	----
High Alarm	-HI-	-HI-
Standby High	-SH-	-SH-
Low Alarm	-LO-	-LO-
Standby Low	-SL-	-SL-
Deviation High	-Hd-	-Hd-
Deviation Low	-Ld-	-Ld-
Deviation	-dE-	-dE-
Timer End	-tn-	

Consideration

1. Auto-Tuning is not operation when ON-OFF control mode, timer operating or limited output %. AT spend time is defferent by each system. During AT, may overshoot.
2. Display blink **burn** when input signal or sensor break.
3. Use **ENT** key for timer start or stop. After time set, push 2 sec. over then time start or stop. If timer start during AT, AT will be stop.

7 Wiring

SDU990 / 940 / 490

SDU770

SDU440